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**Colorado State University's**
**Information Science and Technology Center (ISTeC)**
***presents <u>two</u> lectures by***

# Dr. David Padua

Donald Biggar Willett Professor of
Computer Science
University of Illinois at Urbana-Champaign

## ISTeC Distinguished Lecture
## in conjunction with the
## Electrical and Computer Engineering Department and
## Computer Science Department Seminar Series

# "Parallel Computing for Everybody"

**Monday, November 28, 2011**
Reception: 10:30 a.m.
Lecture: 11:00 – 12:00 noon
Location: Lory Student Center Room 226

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## Electrical and Computer Engineering Department Seminar
***sponsored by ISTeC***

"Autotuning for High Performance"

**Tuesday, November 29, 2011**
Lecture: 11:00 – 11:50
Location: Engineering Room B105

# ABSTRACTS

## "Parallel Computing for Everybody"

Parallelism permeates computing. From processor components to the cloud, it is and has always been one of the main computer design paradigms. Understanding parallelism is necessary to understand computing and its possible evolution. This is especially true in our times, the beginning of the era of parallelism, when performance gains are for the foreseeable future likely to be driven by parallelism. In this talk, I will present an overview of parallel computing and discuss some of the challenges and unanswered questions in this area. An important such question is which applications will drive future developments in hardware and software. Not all classes of applications benefit from parallelism. A second question, of great interest for computational scientists, is what tools and languages will be used to program parallel machines. Today, compilers and other tools provide limited support, programming notations are still evolving, and there is no universally accepted solution to the notation problem. For computer scientists, a main concern is how to design future parallel machines for programmability, reliability, and performance, including execution time and energy consumption.

## "Autotuning for High Performance"

Program optimization is complex and laborious. And the growing complexity of machines and software has made this task even more difficult with time. Although one of the goals of compilers is program optimization, programmers must choose algorithms and data structures that the compiler typically does not change. Autotuning is a program optimization methodology that can be used to implement program synthesizers. At installation time, autotuners explore the space of possible versions of a computation by varying implementation parameters and, in some cases, algorithms and data structures. Each version is evaluated to select the best performing for deployment. This selection can lead to a single version when performance does not depend on the input data or to tables that can be used at run time for version selection based on the characteristics of the input data. The end result are systems that significantly reduce the cost of program tuning for each new platform and produce codes that are competitive and in some cases better than manually-developed libraries. In this talk, I will discuss current and past work in autotuning at Illinois and present what I consider the most important challenges still to be addressed in this promising area of research.

## SPEAKER BIOGRAPHY

David Padua (http://cs.illinois.edu/people/faculty/david-padua) is the Donald Biggar Willet Professor of engineering at the University of Illinois at Urbana-Champaign, where he has been a faculty member since 1985. At Illinois, he has been Associate Director of the Center for Supercomputing Research and Development, a member of the Center for Simulation of Advanced Rockets' Science Steering Committee, and chair of the College of Engineering Faculty Advisory Committee. He has served as a program committee member, program chair, or general chair for more than 60 conferences and workshops. He served on the editorial board of the IEEE Transactions of Parallel and Distributed Systems and the ACM Transactions on Programming Languages and Systems (TOPLAS). He was editor-in-chief of the International Journal of Parallel Programming (IJPP) and Steering Committee Chair of ACM SIGPLAN's Principles and Practice of Parallel Programming. He is member of the editorial boards of the Journal of Parallel and Distributed Computing and IJPP, and Editor in Chief of the Encyclopedia of Parallel Computing (Springer-Verlag). His areas of interest include compilers, programming tools, machine organization, and parallel computing. He is a fellow of the IEEE and the ACM.

**To arrange a meeting with the speaker**, please contact MaryAnn Stroub at mstroub.engr.colostate.edu or (970)491-2708.

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